Self-Service Screens

Design
Age
Ideas
No. 5-8

Royal College of Art

DESIGN AGE
INSTITUTE

About

Zihao is an interdisciplinary designer and design researcher.
His practice is dedicated to exploring the connections between ageing and ethinicities, as well as the longevity economy.
He observes and critically reflects on his surroundings and social issues, constantly exploring his artistic influences and challenging professional boundaries through his passions for visual design, inclusivity and accessibility, architecture and photography.

Zihao obtained his degree in Visual Communication Design at the Tsinghua University, and second master degree at the Royal College of Art, London, in Information Experience Design from 2022.

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Foreword

Colum Lowe, Director, DAI

I once heard it said that until a hundred years ago, a person could reasonably expect the world into which they were born and then died to be vaguely similar. This is no longer the case. The pace of change we are witnessing in today's society is greater than ever before, and nowhere is this more apparent than in the world of digital technology, which is an increasingly invasive, but important part of our lives.

New technology, whether digital, medical, or mechanical, only achieves mass adoption when the technology itself disappears from the user's awareness. You should not need to be an expert on the internal combustion engine, anti-lock braking systems, or the chemical composition of climate control fluids to operate a modern car. The same is true with digital technology. Much progress has been made by computer and smartphone manufacturers who are striving to make the human-machine interface of their devices as intuitive and 'technology-free' as possible, which we all appreciate.

However, one area that seems to lag behind the rest, and is growing all the time, is the digital kiosk. Whether self-service supermarket checkouts, airport check-ins, train ticket booking machines, or parking meters, the rise and rise of the digital kiosk is ubiquitous. Yet, the human-machine interface is frequently so poorly designed that it excludes those who are not fluent or confident with this new technology. At the institute, we have heard of older adults who actively choose not to shop on their local high streets simply because they cannot operate the parking machines.

Hence the need for this publication: to highlight the issues with the interfaces of this kind of digital technology and promote the necessity of age-inclusive design in their creation and production.

Introduction

Design Age Institute

The Design Age Institute is the UK's national strategic unit for design and the healthy ageing economy. We bring together designers, businesses, researchers and communities to help address the challenges and opportunities of an ageing society.

Based at the Helen Hamlyn Centre for Design at the Royal College of Art and funded in 2020 by Research England, Design Age Institute partnership brings together skills and expertise from world-leading organisations in research, design, innovation and learning – the U.K.'s National Innovation Centre for Ageing at Newcastle University, the Oxford Institute of Population Ageing, the International Longevity Centre U.K. and the Design Museum.

Organisations
Design Age Institute (DAI)
UK National Innovation Centre for Ageing (NICA)

Project
Overviews

Design Age Ideas
DAIdeas Series
DAIdeas

UK National Innovation Centre for Ageing

The UK's National Innovation Centre for Ageing (NICA) is a world-leading organisation supported by an initial investment from the UK Government and Newcastle University – to help co-develop and bring to market products and services which create a world in which we all live better, for longer.

NICA brings together cross-competence professionals and researchers, commercialisation experts, scientists, innovators, and technologists working closely together with the public in a seamless way, exchanging their intelligence. Together with their sister organisation VOICE® - an international network of thousands of 'innovation savvy citizens' - they have developed a novel approach, Ageing Intelligence®.[1]

Exhibition at RCA

Project:
Re-design self-service screens

With advancing years comes a change in how we interact with technology products and self-service screens, and our ability to engage with or to learn new services can weaken as we age. As the digital divide widens, there is a need for more inclusive and considerate digital services to cater for those who are excluded. Based on the insights of the existing transport digital service systems (car parking metres, ticket kiosks, check-in/out machines, car charging points, etc.), the main goal was to develop a better approach to improve the user experience, interaction, accessibility, intuition, privacy, safety and reassurance among the older adults and vulnerable groups.

I am Zihao, a Royal College of Art graduate with a multidisciplinary creative background and a passion for creating positive impacts and giving a voice to vulnerable groups. As the main designer and researcher of this project, I observed and critically reflected on my surroundings and societal positioning, constantly exploring my own design influences and challenging my professional boundaries through my passion for user experience, inclusivity and accessibility.

For the duration of the project, I travelled between Newcastle and London, working both in the NICA and RCA offices, collaborating with various departments. I interacted with various academics, practitioners, researchers, designers and stakeholders, to allow me to utilise a qualitative research approach to co-design with my users.

Methodology: Qualitative Research

Applied methods: Documents review; observation study; interviews; mixed method surveys; focus groups/co-create workshop; case study.

Process: Participatory Design

Under the Double-Diamond framework, we applied a participatory design process, co-design with users, among to develop strategies for improvement and gained in-depth cultural, societal, or usage scenario insights.[2]

Audience: Target Users

The result pertains to all age groups, but in this instance, there are priority target user groups:
Primary target users: Generation J (age 59 -68); Boomers (age 69 - 77)
Secondary target users: Generation X (43 - 58); Post War (78 and above).

Problems: Resistance in the Project

Lack of support from the frontline industries (i.e. LNER railway); short time period; no previous projects as references; low public engagement and consequently a lack of user data.

DAIdeas Series

We all want desirable products, services, and environments that help us age well. By 2043, 1 in every 4 people in the U.K. will be age 65+, making designing for our future selves more urgent than ever[3]. The **Design Age Ideas** series of short reports shares research and provocations to help all of us reimagine and realise desirable design for healthy and happy ageing.

The **Design Age Ideas** series aims to help piece together the puzzle of ageing well by curating the work of the Design Age Institute, our partners, and external findings into content that provokes further curiosity and critical engagement with how we design for an ageing population.

As consumers, users, and citizens, we are all either limited or enabled by design each and every day of our lives. Whether you are responsible for creating design or not, we all are impacted by how design does or does not respond to what we want and need. That's why it's important to collaboratively consider **Design Age Ideas** that can help shape a positive future for ourselves and for our society.

"With life expectancies at birth creeping ever closer to 100 years by the end of the 21st century this will be <u>a century of centenarians.</u>"

— George W. Leeson, Oxford Institute for Population Ageing

DAIdeas

No. 5-8

Different from the Design Age Ideas No. 1 - 4, Design Age Ideas Series No. 5 - 8 are each extracted from a full self-service interface project, that continues to piece together the design age puzzle. The following four DAIdeas will be used throughout the publication:

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5 Close Digital Divide

6 Tackle Lazy Exclusion

7 Combine Research Methodologies

8 Do It Together: Co-creation

The four principal tenets of DAIdeas will be seamlessly incorporated into the overarching narrative of the publication, rather than being delineated in discrete chapters. The narrative structure of this work will adopt a design-led methodology, emphasizing a systematic and theoretical framework to guide the exposition[4]:

- **WHY:** sets the scene by analysing the social phenomenon, the problem, and reasons for initiating the project.

- **WHO:** identifying the target audience, and analysing the users from the perspective of cultural, societal, or usage scenario.

- **WHAT:** the content of the design, and the shortcomings of the existing product.

- **HOW:** project process of applying qualitative research methods and co-design frameworks, elaborating how we collected and analysed the user data, and how we can use them to develop further strategies.

- **NEXT:** reflecting on the progress, making speculations for the future by providing suggested design principles.

WHY?
Why are we designing?

Phenomenon

By 2030, 1 in 6 people in the world will be aged 60 years or over[5], yet many people are oblivious to the fact that ageism is all around us. Exclusive digital services and products have been expanding the digital divide, resulting in more critical information inequity and thereby exacerbating resistance of digitalisation. We are in a phase of technological transformation, 'the old school' and 'the new school' are coming to a clash, where everything is changing rapidly.

In transportation, the industry tends to withdraw human ticketing services to save costs and move towards full digitalisation. However, across different organisation and geographical regions, Apps and digital interfaces for parking, light railway and trains are superfluous and have not been designed to standard principles catering to those currently excluded, vulnerable or within a marginalised groups. In the UK, more than 72% of older adults felt they weren't spending money as they'd like to. One of the reasons for this is the inconvenience of travelling due to the lack of inclusivity and accessibility in the design of the transport digital system[6]. With a constant introduction of new technology products and apps to market, there is an urgent need to come up with a novel approach to cater for the excluded audience.

The Problem

- With advancing years comes a change in how we interact with kiosks and products that **require digital literacy**.

- Our ability to engage with these products and services can **weaken as we age**.

- Advances in technology and new products and services **place new demands**.

- There is a need for advanced and better digital interfaces to cater for **change abilities and needs**.

Designer's Experience

Drawing from both my experience as a user and my expertise as a designer, I have valuable insights to share. Having not been raised in the UK and with English not being my first language, I sometimes struggle with transport kiosks, stemming from language nuances, interaction conventions, and limited system guidance. I am also on the spectrum of neurodivergent where different user interfaces can cause me confusion and results in me receiving fines for buying the wrong ticket. This perspective reflects that of a 'digital native', let alone the individuals with varying levels of digital literacy or disabilities.

Digital Divide

The digital divide refers to the disparity in access to modern information and communication technologies (ICTs), which significantly affects the interaction between older adults and transport kiosks. Older generations constantly under the negative impact of the digital divide can result in: some refrain from driving due to struggles with car parking metres; no access to discount offers due to challenges with digital services; and a preference of buses over metro/tubes due to difficulties navigating ticket machine operating systems. It is important to note that none of the above are the users' fault, rather, it highlights the need for digital services to consider older adults' specific needs and abilities.[7]

Resistance of Digitalisation

In my interview with Dr Gerard Briscoe, we explored this concept in-depth. Although, as a proactive force, 'Resistance of Digitalisation' is not yet a clear terminology, here we mainly refer to the current status of older adults refusing to use digital services.

The causes of this phenomenon are complex and result from a variety of circumstances, including but not limited to:

- Electrodermal Conductivity - fingers sensitivity to screens weaken as we age[8];

- Older people prefer human interactions to solely engaging with machines;

- Expressing concerns about the adequacy of digital services in ensuring their privacy and security, especially for buying tickets;

- Cognitive abilities may gradually decline with age, which can hinder one's capacity to adapt to emerging digital services[9];

- Feeling overlooked and underestimated by digital services for an extended period (geriatric phones) can provoke a sense of rebellion.

It highlights the imperative to enhance existing services to captivate audiences, igniting their interest to learn digital services and encouraging their engagement with digitalisation.

Not just for the older adults...

In fact, it's not just the older adults who are struggling with transport kiosks, many of the younger digital generation are too. Uber drivers have voiced their struggle to me with charging their vehicles, citing a shortage of charging stations and prolonged wait periods as key challenges. Numerous individuals have mentioned their fear about using unfamiliar kiosks, concerned about potential embarrassment or feeling out of place, or furtherstill, losing money or getting fined. The majority of users I've interacted with have encountered instances where they were overcharged by the machine and struggled with getting refunds.

WHO?
Who are we designing for?

Audience
Segmentation
Main targets & Secondary targets

Trends
Non-use Users - 'The Black Hole' Theory
Pin Point Target Audience - Digital Literacy Analysis

Audience

The goal of this project was to design services that apply to all ages. However, certain groups need more urgent support, which became our priority. The primary target user groups are among two generations: Generation J (59 - 68) and Boomers (69 - 77); and the secondary target are Generation X (49 - 58) and Post War (78 and above).

Age Division Method

The research combined two demographic segmentation methods - Life cycle and Generational. The Life Cycle method is a demographic segmentation strategy in which a product-market is grouped into segments based on the basis of age so that the organisation can more precisely target its offerings to the needs and wants of each stage of life of interest to it[10]. Generational segmentation, also known as generational marketing, refers to segmenting and dividing your target audience, whether customers or prospects, into separate groups based on their age and the generation they belong to[11].

We applied Generational Segmentation as our main approach, with Life Cycle as a reference. As the generational method divides the audience's age within a cultural scenario, this allows us to analyse the relationship more deeply between our audience and emerging tech products.

Generational Segmentation

● **Primary target audiences**
Generation J: 59 - 68; Boomers: 69 - 77

● **Secondary target audiences**
Generation X: 43 - 58; Post War: 78 - 95;

'Non-Digital Native' and 'Digital Divide'
The majority of target users are non-digital natives, not growing up in the information age or with the presence of digital technology, which made them feel vulnerable when engaging with self-service screens. The digital divide mentioned in the previous article is also a key component, since it forms a vicious cycle in conjunction with the resistance of digitalisation, being counterproductive to facilitating interactions between target users and kiosks.[12]

2003
First smart phone

1989
World Wide Web

1977
First Kiosks

1971
First personal computer

| 2013 | 2004 | 2003 | 1994 | 1993 | 1984 | 1983 | 1974 | 1973 | 1964 | 1963 | 1954 | 1953 | 1944 | 1943 | 1934 | 1933 | 1924 | 1923 |

Born between 1997 - 2012

Born between 1981 - 1996

Born between 1965 - 1980

Born between 1955 - 1964

Born between 1946 - 1954

Born between 1928 - 1945

Born between 1922 - 1927

11 - 26 years: **Generation Z**

27 - 42 years: **Millennials**

43 - 58 years: **Generation X**

59 - 68 years: **Generation J**

69 - 77 years: **Boomers**

78 - 95 years: **Post War**

96 - 101 years: **World War II**

| 10 - 19 | 20 - 293 | 0 - 39 | 40 - 49 | 50 - 596 | 0 - 69 | 70 - 79 | 80 - 89 | 90 - 991 | 00 - above |

Digital Native

Digital Immigrants

User Trends

'The Black Hole theory' – Professor Nicola Palmarini, Director of NICA

Nicola introduced an intriguing concept: 'The Black Hole' theory, which considers 'Non-use Users', primarily pertaining to users who possess the capacity but have a reluctance to engage. Typically, they exhibit a level of digital literacy enabling them to navigate digital services independently. Yet, their disinterest lies specifically in acquainting themselves with a particular category of tech products. In this project, 'Non-use Users' generally refers to the target audience who are comfortable using ticketing apps and can operate at self-service screens without relying on other people, but who do not want to utilise kiosks due to the inconvenience, or for other preferences. However, this user cohort tends to be absorbed in the masses and poses challenges in extracting insights through conventional survey methodologies.[13]

Subdivision

We subdivided three categories under the target audience. Thus, we can better analyse each segment and design more targeted measures to solve the problem later in the research.

'Non-use' users: with average to high levels of digital literacy, yet actively refrain from utilising digital kiosks.

'Can't-use' users: lack any form of digital literacy and are unfamiliar with the operation of digital and technological products.

Users: Able to operate, and are willing to use, digital kiosks.

WHAT?
What do we design?

Physical Services

Kiosks (Self-check screens)

Digital Services

User Experience

User Interface

Problems

Newcastle

London

Interviews

Self-service Kiosks

The first interactive kiosk was developed in 1977 by Murray Lappe. 'The Plato Hotline' was used for informational purposes at the University of Illinois at Urbana-Champaign. During the 1980s, the interactive voice response unit (IVR) expanded as consumers demanded innovative self-service technology[14]. Until today, the integration of kiosks across various industries has become ubiquitous, serving as an indispensable component and supplementing manual services to a considerable degree.

The definition of a kiosk is an interactive touchscreen device that allows customers to buy products or services without the help of a staff member. It includes both hardware and software components that make it possible for customers to browse items, to place orders, and to pay independently[15]. Kiosks can also help raise brand awareness and provide an interactive way for consumers to engage with a company[16].

The official definition remains somewhat rigid and opaque, failing to adequately reflect the ongoing evolution of kiosk technology and lacking the intuitive clarity necessary for users. Drawing upon my own observations and analysis, I define kiosks according to the following three criteria: It contains a **screen** that can be **interacted by** costumers, providing a (end-to-end) **service**. The primary objective of this project is to formulate strategic blueprints for future kiosk development through comprehensive analysis of existing services. The emphasis, while not exclusively restricted to, centres on **railway ticket machines**, **parking metres**, and **car charging points**.

Purpose:
Ticketing Services

Types:
(Light) Railways,
Check-in/out
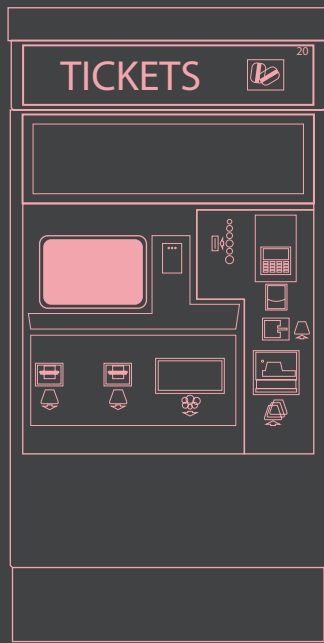
Nexus Metro Kiosks
Newcastle
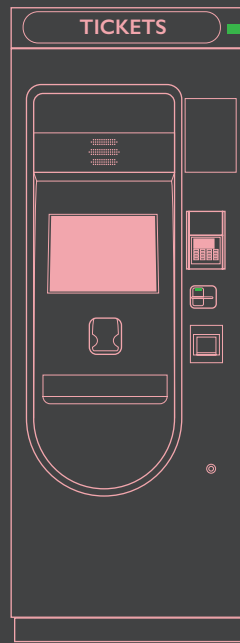
LNER Railway Kiosks
Newcastle
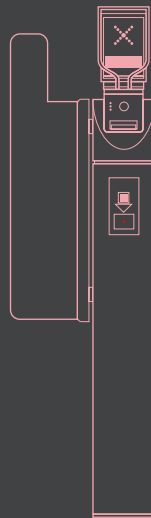
Tickets Barriers
Newcastle
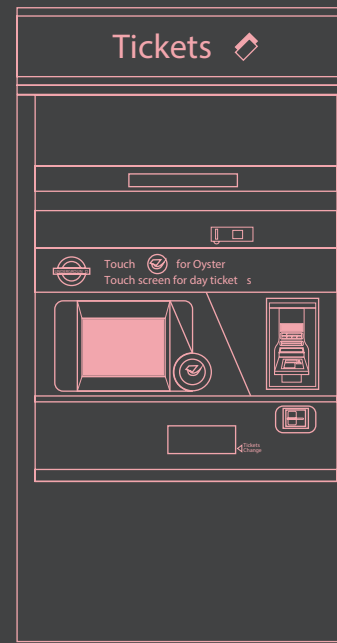
TfL Underground Kiosks
London

TfL Barriers
London

Ticket Kiosks

We have identified these specific examples as primary targets for enhancement, focusing on geographic location (London and Newcastle), frequency of daily use, and passenger traffic patterns. Notably, the tap-and-go service of TfL kiosks in London exhibits commendable consistency within the system, while the LNER service excels in expediting assistance during operation issues. However, overarching concerns persist regarding the accessibility, operational hierarchy, privacy, and accommodation of diverse disabilities across all ticket machines.

Good examples: TFL services (but still have problems for kiosks)
Bad examples: Nexus Metro, LNER
Problems: Lack of accessibility and privacy; no hierarchy in operations, requirement of previous knowledge; not adapted to people with different disabilities and conditions; absence of consistency; bad physical condition; lacks sufficient visual prominence; oversized machines; screens are not sensitive enough; and exclusive payment methods (i.e. Pop card)

Purpose:
Car parking / charging

Types:
Parking metres /
Charging points
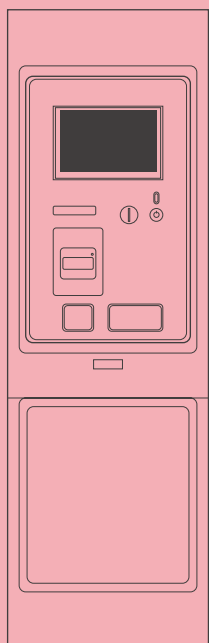
Parking Metre Kiosks 1
Newcastle
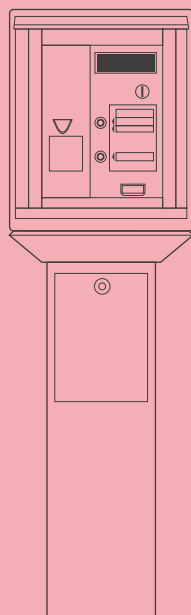
Parking Metre Kiosks 2
Newcastle
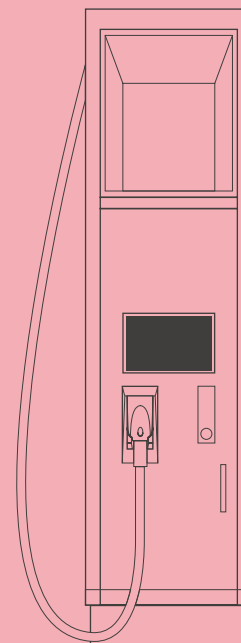
Fastned Kiosks
Newcastle
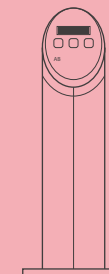
Tesco Kiosks
Nationwide
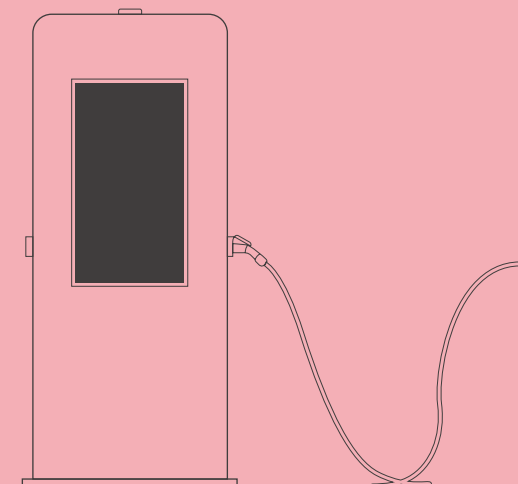
Car Parking Metres & Charging Points

Varied operating systems, from parking metres to charging points, often lead to user inconvenience. Parking metres pose challenges with complex operations and unclear instructions. Lack of consistency in usage, spanning from apps to manual operation, further compounds the issue. The scarcity of charging points, often requiring App's navigation, poses challenges in locating them, compounded by long queues. Furthermore, quick charging options often incur higher fees, prompting users to opt for home charging over public stations.

Good examples: Fastned Kiosks
Bad examples: The rest
Problems: Lack of accessibility; no hierarchy in operations, requirement of previous knowledge (digital literacy); not adapted to people with different disabilities and conditions; absence of consistency; bad physical condition; lacks sufficient visual prominence; difficult to locate and scarce in numbers; high price; and inconsistency of service flow.

Digital Service

Digital service refers to the software component, and just as important as the hardware component, if not more so, and determines the overall **user experience** for most audience. If the physical kiosks determines whether the service can be deployed, the digital service defines if the service can be run and finished, i.e. tickets purchase, parking payment.

User Interface (UI)

UI serves as the interactive medium between humans and computers, predominantly manifested in kiosk software components and touchscreen applications within this project. These interfaces facilitate a streamlined ordering workflow, enabling users to accomplish various tasks such as paying parking fees, charging vehicles, or purchasing tickets for transportation services. Typically, UI embodies the service structure digitally, presenting step-by-step dialogues that guide users through their service journey. On the right side of the page, those pink rectangles are where the interface took place, which may feature a combination of physical buttons and touch interactive capabilities[17].

However, on the field of transport kiosks, there are rarely good UI examples, especially aiming for older generations. The common problems are: didn't consider the aspect of inclusivity; inconsistent service flow; bad wordings; lack of hierachy; font sizes too small; unclear information; too many steps; require prior knowledge; doesn't explain the decisions; having troubles of requiring human assistance.
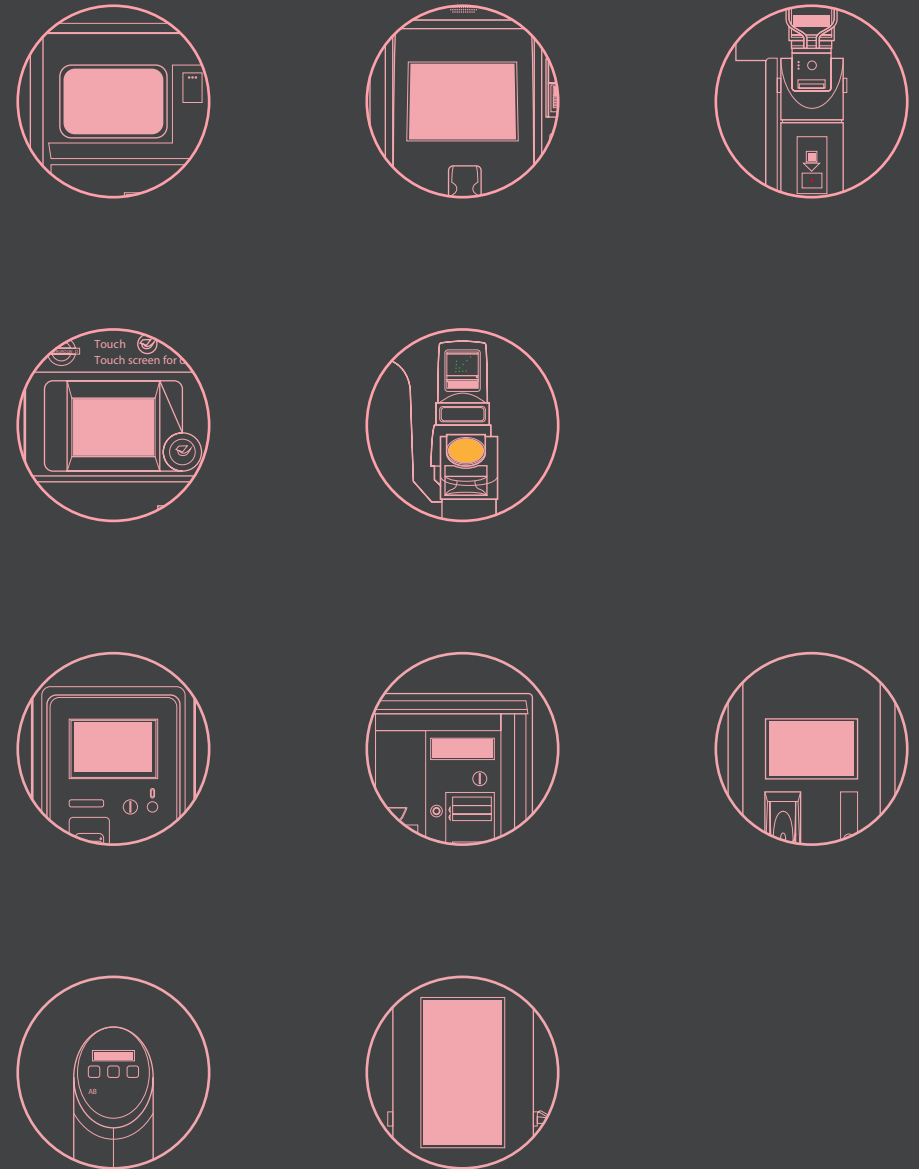
The pink part is the screen, where the general User interface takes place, and is the main interface and means of interaction with the user for kiosks at the moment.

Summaries of problems

Physical Service Problems
Lack of accessibility and privacy; no hierarchy in operations, requirement of previous knowledge; not adapted to people with different disabilities and conditions; absence of consistency; bad physical condition; lacks sufficient visual prominence; oversised machines; screens are not sensitive enough; exclusive payment methods (i.e. Pop card); bad physical condition; lacks sufficient visual prominence; difficult to locate and scarce in numbers; high price; and inconsistency of service flows

Digital Service Problems
Inconsistent service flow; unclear wording and information; lack of hierarchy; font sizes too small; too many steps; requirement of prior knowledge; doesn't explain the decisions; requiring human assistance at times; and doesn't align with audience's familiarity of digital devices.

Other Service Problems
In today's App-centric culture, users have access to a plethora of offers through transportation applications, yet discounts are not available when purchasing through kiosks. Furthermore, interactions with humans or the use of applications afford users more flexibility and access to real-time information, which kiosks are unable to provide.

Principles of Services

Service Design Rules
After integrating digital and physical service problems, we can distill fundamental principles of service design for the kiosks. This will guide our focus and prioritisation in the subsequent design phases of this project[18].

- Be easy to find;

- Clearly explain the purpose and its decisions while operating;

- Facilitate user goals and has no dead ends;

- Work in a way that is familiar;

- Require no prior knowledge to use;

- Require minimum steps to finish;

- Be consistent throughout;

- Be usable by everyone, equally; and

- Make it esy to get human assistance.

Locations

Newcastle to London

This project centers on the Newcastle Upon Tyne and Tyne and Wear area as its focal point, utilising the Greater London area for cross-comparison and analysis. The iterative nature of the project has seen multiple stages from initial insights pertained from both London and Newcastle city centres. This informed further research which focused on the business districsts of Newcastle and Battersea in London, and ultimately concentrating on Northumberland Street in Newcastle.

Newcastle City Centre

Northumberland Street

Tyne and Wear Area

Locations

Cross Comparison

The London region served as the benchmark for cross-comparison in this project. Given its complexity and diversity, the research has concentrated on two specific areas: Battersea and King's Cross. Battersea Power Station serves as a focal point, when compared against Newcastle's Northumberland Street, while King's Cross is juxtaposed with Newcastle Central Station.

Greater London Area

Battersea Power Station
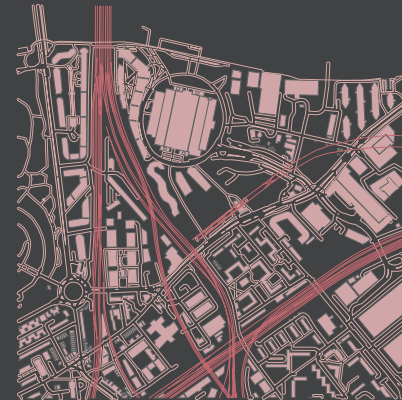
King's Cross Station

HOW?

How did we do it?

How might we encourage older people to be willing to participate in this digitalised transportation system? How might we identify the imperative flaws and enhance the digital system that appeal to users' needs? How could they (older adults), articulate their needs and ideas? How could these ideas and needs be captured and integrated into digital kiosk innovation for all?

As a designer and researcher, I employed participatory design processes combined with two science research methodologies, qualitative research (ethnography)[19] and action research, which have helped me delve into the questions in-depth, redefine the interpretation between the design and ageing demographic, and re-anchor an innovative plan to address the real-world problems.

Document

Focus Groups

Interviews

Observation
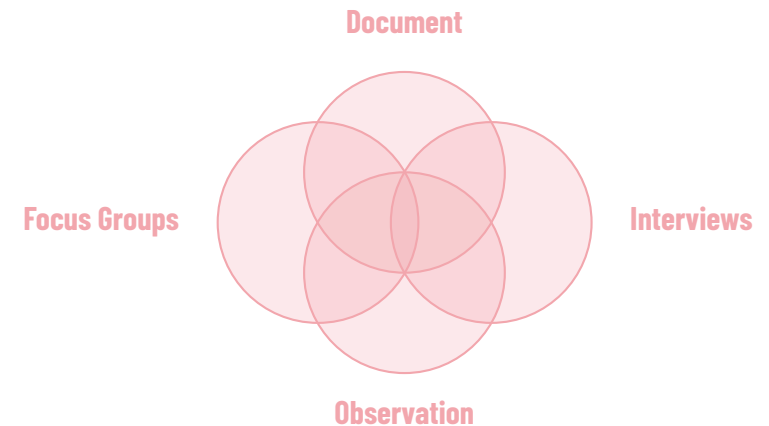
Throughout the project, I primarily relied on qualitative research methods to procure data, employing the above four approaches. Tailoring each method to suit the project's needs, I executed them meticulously, subsequently analysing and evaluating the gathered data with the aid of pertinent design tools.

Qualitative Research

Primary research: interviews

Desk research: literature & document reviews

Survey

Platforms & Questionaires

Development

Focus group workshops

London

Interviews

Desk Research

After defining the phenomenon, purpose, and objectives, qualitative research began. Due to the absence of primary data, my initial focus during desk research involved conducting a thorough document and literature review, alongside case studies of existing products similarly designed.

The desk research encompassed understanding industry approaches to addressing the digital divide, examination of measures implemented, project studies, practitioner and academic consultations for nuanced perspectives, and literature reviews for enhanced understanding of the target audience.

Document & Literature Review
Ticketing kiosks occupy a unique position, caught between the two primary streams of interaction: traditional or familiar human engagement and personalised mobile app ticketing. Despite their significance, kiosks are often undervalued, with limited consideration given to designing them to accommodate older and vulnerable populations.

Project Studies
While these projects may not directly relate to transport kiosks, their physical design, interaction patterns, and conceptual frameworks offer valuable insights. Addressing the kiosks challenges through insights collated from other projects or through technical means, could offer a nuanced solution to the existing bottleneck.

Fun Theories – Ballot Bins
Each bin displays a question and two answers. Smokers vote by putting their cigarette butt in the slots underneath their preferred answer. Smokers find the Ballot Bins much more engaging than alternative ashtrays and are more likely to use them. Independent evaluation shows the Ballot Bin reduces cigarette butt litter by 73%[21].

Emerging Technology – Emotiv
EMOTIV is a bioinformatics company advancing understanding of the human brain using electroencephalography (EEG). It aims to track cognitive performance, monitor emotions, and control both virtual and physical objects via machine learning of trained mental commands. Helpful in detecting mood, concentration, physical condition, etc. on a daily basis[22].

People's emotional attachment to their past selves and societal conditioning is what makes it harder to accept changes. Individuals often develop comfort with their existing lifestyle, leading to discomfort when attempting to enact change, a sensation humans typically and naturally try to avoid[20]. The clash of 'Old School and New School' mentioned in the previous chapter is an example of this: the new digital mode of ticketing has impacted on traditional manual ticketing behaviour, leading to resistance and adoption of new technologies. This can be addressed through two directions: firstly, by introducing 'fun theory' that stimulates a user's engagement; and secondly, by imbuing it with an familiar design in appearance or service level.

Many technological products weren't tailored for older users. However, with slight tweaks, these products hold significant potential to cater to the older demographic. As with NICA's project with Emotiv which ports EEG technology to transport services in the future (ticketing, parking, etc.), projects like Informetis have the potential to track usage patterns between users and kiosks, facilitating further enhancements.

Other project study including:

30 & 90 year Phone; Music For Life; Care Home Choir; Informetis; VIA; Dial-for-a-Ride; Mobile-As-A-Service; Tech Totem 'TETO'

Interviews with Practitioners

A good kiosk service should also be able to act as a transport hub, connecting different services for the convenience of the users. It also promotes a strategic angle, aimed at addressing underlying issues rather than merely surface-level assumptions.

Last (First) Mile Travel:
Money Well Spent report indicated that over 52% of older adults encounter challenges with 'getting to & around places'. With Last/First Mile Travel being identified as a primary concern. The Last/First Mile Travel refers to the initial or final segment of a journey, encompassing the transit of passengers from transportation hubs such as stations or car parks to their ultimate destination, or vice versa. Many industries also cite it as the most expensive and most time-consuming problem. However, there are already a number of services on the market to address this, such as Dial-a-Ride (TfL), and VIA services. By integrating these services, a kiosk can incentivise older users to engage and acquire digital literacy skills, thereby reducing the digital divide and ensuring a successful travel experience.

Third Place (Thing):
It denotes social settings distinct from home, and the workplace, examples include churches, clubs, pubs, high streets, cinemas, holiday destinations etc. Most older users prioritise experiential purchases, yet there are limited methods available to bring them to the third place. If a kiosk service could connect them with the information of third places or things, that could raise the users' motivation for engaging with the digital transport service[23].

A good kiosk service should address & reach the final goals of its users.

Primary Research

The research location underwent iterative refinement. Initially encompassing the broader regions of the North East and Greater London, before gradually narrowing its focus to a localised scale, with a primary emphasis on Northumberland Street within the Newcastle Upon Tyne city center.

London to Newcastle

In this project, London serves as a direct comparison area for Newcastle. Both cities boast significant ageing populations and developed kiosk networks. However, due to the intricacies of London's landscape, I've chosen to concentrate on Battersea Power Station, a business district within This Age Thing's sphere of influence, for more focused research efforts.
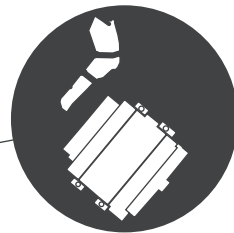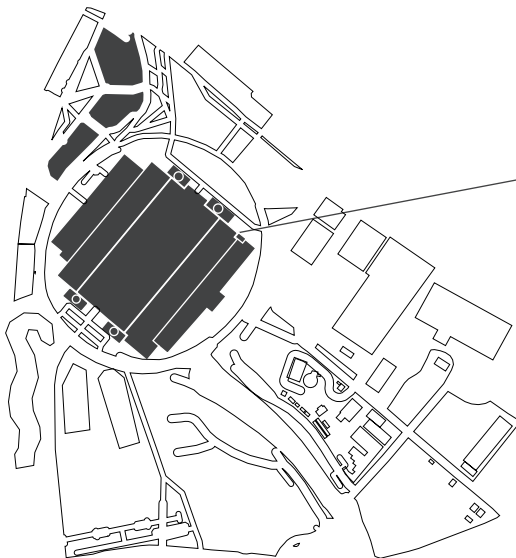
Battersea Power Station

Kiosks within the Battersea area are primarily clustered around the Battersea Power Station shopping center, predominantly catering to information inquiries. Additionally, certain cafes situated outside the shopping center provide kiosk-based ordering services.

Advertising 42.6%

Information 19.5%

Interactive 37.9%

Total Screens: 195

Food 23.0%

Shop 2.7%

Transport 8.1%

Information 5.4%

Banking (ATMs) 37.8%

Supermarket 23.0%
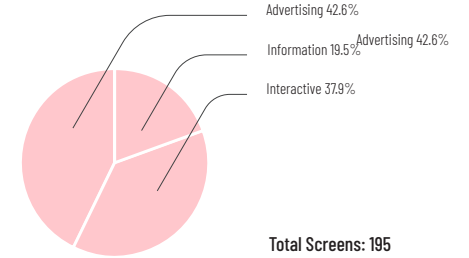
Northumberland Street
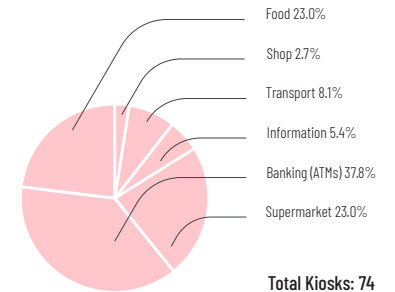
Total Kiosks: 74

Screen 'Forage' in Northumberland Street

The research conducted in Newcastle went through several iterations, transitioning from initial explorations in the city center business district to a focused study on Northumberland Street. It stands out as one of the most densely populated areas for kiosks in Newcastle, boasting a notable concentration of 195 visible screens on streets. Of these, interactive kiosks represent over 37%, reflecting a diverse array of genres. Employing methodologies like ethnographic observational studies and semi-structured interviews I conducted 'Screen Foraging'. I systematically plotted and analysed the data from the street's kiosks, culminating in a comprehensive form. This was followed by an further analysis utilising the refined **DAI Age-Inclusive Design Evaluation tool (ADE)**, specifically tailored for kiosk data assessment.

DAI Age-Inclusive Design Evaluation Tool (ADE) Updating

The ADE Tool is created to evaluate the design of a product, service or environment to better understand how Empowering, Enabling, and/or Enriching it is for older people. The purpose of the ADE tool is to help users, designers, and clients thoughtfully evaluate existing and future products, services and environments, to ensure design meets or has met people's needs and wants. While the importance of each element may change based on the particular use of a design, Design Age Institute believes the 3-E approach can help us create a more equitable, inclusive society.

Originally, DAI's evolution of this tool focuses on a 3-E approach, defined as: **Empowering, Enabling, and Enriching**. Each approach has three elements to review an actual design work. However, the tool was created for all design products, and when used to evaluate kiosks I found that some of the elements were not applicable, so I made appropriate adjustments to the ADE tool based on the specific needs of this project. In doing so, it was made more convenient for designers as well as stakeholders to evaluate the design of traffic kiosks.
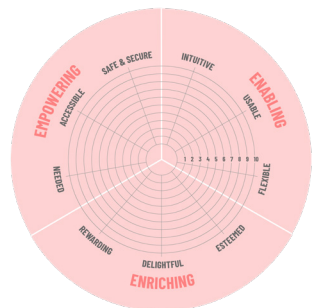
Origianl ADE Tool:

The original ADE tool is actually very powerful, but I have improved the 'Needed, Safe & Secure, Flexible, Delightful' to meet the specific needs of this project.

For example, I think 'Inclusive' is more appropriate for this slot than 'needed'. In some cases the Kiosk service is the only option that doesn't lend itself to still assessing the level of 'need'.
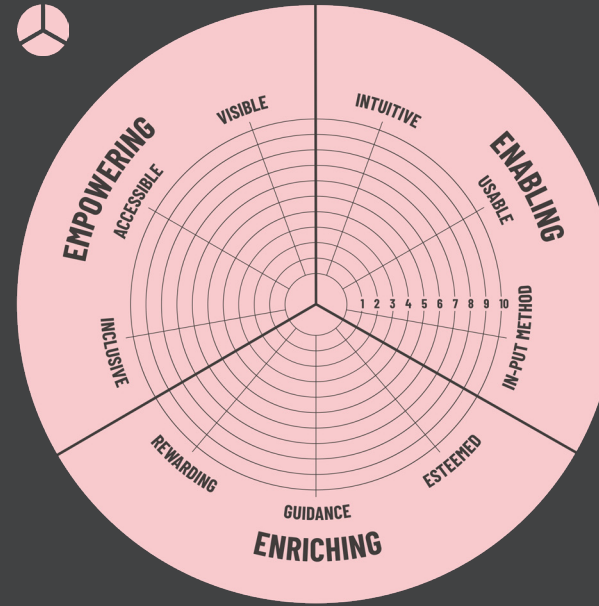
Updated ADE Tool:

Tool diagram with adjustments made for this project. I changed some details based on the rules of using the service of kiosks, as well as the purpose, etc., but did not change the three main items.

Updated Elements:

Needed – **Inclusive**
Safe & Secure – **Visible**
Flexible – **In-put Method**
Delightful – **Guidance**

Empowering

Inclusive – Does it can be used by everyone, equally?
Accessible – Does it can be accessed by everyone, euqally?
Visible – Does it explain its purpose, and easy to be found?

Enabling

Intuitive – Does the service require prior knowledge to use?
Usable – Is the service running consistently and smoothly?
In-put Method – Does the kiosk respond effectively?

Enriching

Rewarding – Does it reward the users? (offers, discounts)
Guidance – Does it provide any tutorial or guidance?
Esteemed – Does the interactive space pleasing?

Kiosks Data Collection and Evaluation Analysis 1
Overview of basic information on the screen, including number, commonalities, and total scores.

Kiosks Data ECollection and Evaluation Analysis 2
Detailed scores from the ADE tool assessment, and brief interpretations.
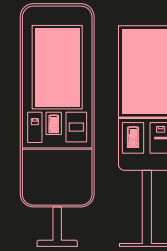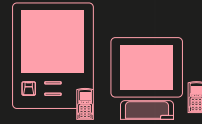
See pages 58-59 for Analysis 1

See pages 60-61 for Analysis 2

Analysis Diagram 01

Total 195 screens, with 74 (37.9%) screens are intreactive kiosks, which
are our main data research and analysis targets.

Evaluation

Kiosks data
collection
and analysis

Name	Haymarket Metro Ticket Kiosk	Defibrillator & Information	B.T. Hubs	M&S / Sainsbury's Tilts	ATMs (11 brand variations)	Mcdonald's kiosks	KFC & Jollibee's kiosks	JD's in-store digital kiosks
Functions	Metro tickets purchasing Pop Card charging	Emergency, information, charging, nagivation	Emergency, information, charging, nagivation	Supermarket self-check-out	Cash withdraws, Balance checks, Pin code changes	Food ordering	Food ordering	Browsing products
Steps	7 steps for ticket purchaings 9 steps with receipts 5 steps for charging Pop card	-	-	5 steps	5 steps	-	-	-
Quantities	06	02	02	17	28	10	07	28
Scores	4.22	4.78	3.89	5.78	3.89	6.00	6.67	2.89
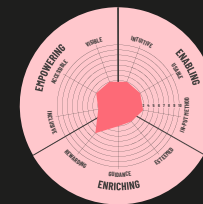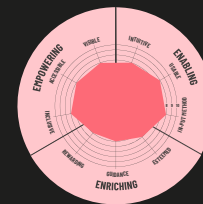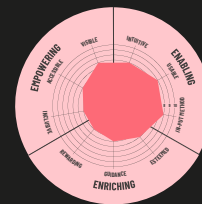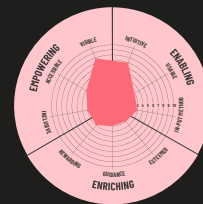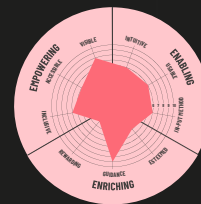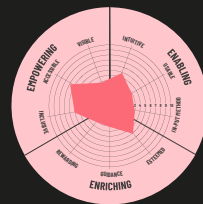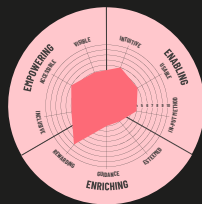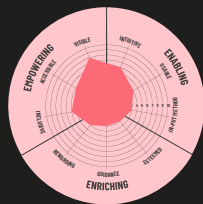
Summaries

Among the eight kiosks analysed, encompassing various subtypes, merely two garnered a score exceeding 6, reaching a maximum of 6.67. The collective average score amounted to 4.76. Considering a pass mark of 6, it becomes evident that the design of the Northumberland street's digital kiosks is falling short.

In the 'Empowering (5.33)' category, the majority of designs exhibit a deficiency in **Inclusive (4.63)** and **Accessible (5.25)**, while **Visible (6.13)** gained relatively higher scores.
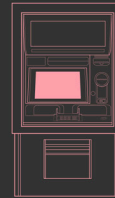
In the '**Enabling (5.21)**' part, none of the criteria met the passing mark. However, this category had the strongest average performance (7.67) among the two highest scoring kiosks.

The '**Enriching (3.75)**' part yielded the lowest scores, with none the criteria surpassing a rating of 5. Interestingly, supermarket kiosks notably achieved a score of 9 in the **Guidance** criterion.

Analysis Diagram 02

Evaluation
Kiosks data collection and analysis

Empowering

Criteria	Tickets	Defibrillator	999 Phone	Small Screens	ATM	Self-Order Kiosk 1	Self-Order Kiosk 2	Tall Kiosk
Empowering (avg)	6.00	5.33	5.00	6.33	5.00	5.33	7.00	2.67
Inclusive	5	5	5	6	3	4	7	2
	Cannot be used by everyone equally. (wording, neuro-diverse etc.); have 6 language & audio option	Cannot be used by everyone equally. (wording, neuro-diverse etc.); have 4 language & audio option	Cannot be used by everyone equally. With only 'Defibrillator' on top, but doesn't explain other functions or usage	Cannot be used by everyone equally. Has problems in many aspects but very convenient for human support	Cannot be used by everyone equally. No language options, no conveniency for neuro-divergent groups, etc.	Cannot be used by everyone equally. Wording, neuro-diverse etc, no language or audio option	Cannot be used by everyone equally. (wording, neuro-diverse etc.); have 8 language & audio option	Cannot be used by everyone equally. (wording, neuro-diverse etc.); no language or audio option
Accessible	5	6	7	5	4	5	7	3
	Cannot be accessed by everyone equally. Bad sizes; No Braille, human support; but with most payment method and enough space	Can be accessed by everyone mostly. Screen tall but with a mapping pad, enough space for wheelchairs	Can be accessed by everyone mostly. Small and hollowed screens; with braille for emergency/phone	Cannot be accessed by everyone equally. Screen angle and height, and kiosk space doesn't apply for all	Cannot be accessed by everyone equally. Not disability-friendly, very in-convenient for human support	Cannot be accessed by everyone equally. Screen height, payment methods, not friendly for mobility disables	Can be accessed by everyone mostly. 'Accessible button' making screen lower, very easy to get human support	Cannot be accessed by everyone equally. Screen angles, some staff don't know how to use it, stairs/escalators
Visible	8	5	3	8	8	7	7	3
	Clearly explained purpose & Easy to be found. Bright colours, bold words, icons, and prominent locations	Doesn't explain its purpose & Not easy to be found. With only 'Defibrillator' on top, but doesn't explain other functions or usage	Doesn't explain its purpose & Not easy to be found. Hard to find the interactive screen	Clearly explain its purpose & Very easy to be found. Icons, visual signs, lights, etc.	Clearly explain its purpose & Very easy to be found. Icons, visual signs, headlines, etc.	Clearly explain its purpose & easy to be found. Icons, visual signs, 'Order Here', etc.	Clearly explain its purpose & easy to be found. Icons, visual signs, 'Order Here', etc.	Doesn't explain its purpose & Not easy to be found. Hard to find the interactive screen

Enabling

Criteria	Tickets	Defibrillator	999 Phone	Small Screens	ATM	Self-Order Kiosk 1	Self-Order Kiosk 2	Tall Kiosk
Enabling (avg)	4.33	5.00	3.67	6.00	4.33	7.67	7.67	3.00
Intuitive	6	6	5	6	7	7	7	3
	Requires prior knowledge but easy to adopt. Not an end-to-end system, doesn't allow users to go 'back', unfamiliar interaction	Requires prior knowledge but easy to adopt. Not an end-to-end system, unfamiliar interaction	Requires prior knowledge but easy to adopt. Not an end-to-end system, unfamiliar interaction	Requires prior knowledge but very easy to adopt. End-to-end system, familiar interaction Always enough staff to facilitate	Does not require prior knowledge to use. Familiar interaction	Doesn't require prior knowledge to use. Familiar interaction, an end-to-end system	Doesn't require prior knowledge to use. Familiar interaction, an end-to-end system	Requires prior knowledge. Not an end-to-end system, unfamiliar interaction,
Usable	4	5	3	6	3	8	8	3
	Not smooth or consistent. No explanation for decisions, sometimes dead ends, information badly designed (i.e Transfare), bad service experience	Not smooth or consistent. Slacking on design of functions, information pages, bad service experience	Not smooth or consistent. No explanation for decisions, slacking on design of functions, information pages, bad service experience	Smooth and consistent. However, some information, discount offers doesn't have clear explanation	Not smooth or consistent. No explanation for decisions, slacking on design of functions, many dead ends	Smooth and consistent. Easy to navigate, UI designed consistently, but too many choices & information that lack of interpretation	Smooth and consistent. Easy to navigate, UI designed consistently, but too many choices & information that lack of interpretation	Not smooth or consistent. Against using habbit, slacking on design of functions, information pages, bad service experience
In-put Method	3	4	3	6	3	8	8	3
	Badly designed interaction or screens response. Slow response, insensitive screens, disordered payment, mixing tickets and receipts slots	Badly designed interaction or screens response. Slow response, insensitive screens, no physical buttons for substitute	Badly designed interaction or screens response. Slow response, insensitive screens, but have physical buttons for substitute	Well Designed interaction and screens response. Fast response, no physical buttons, unclear payment methods	Badly designed interaction or screens response. Slow response, insensitive screens, no substitue buttons for replace	Well designed interaction or screens response. Quick response, sensitive touch screens, but limited payment method	Well designed interaction or screens response. Quick response, sensitive touch screens, but limited payment method	Badly designed interaction or screens response. Slow response, insensitive screens, no substitue buttons for replace

Enriching

Criteria	Tickets	Defibrillator	999 Phone	Small Screens	ATM	Self-Order Kiosk 1	Self-Order Kiosk 2	Tall Kiosk
Enriching (avg)	2.33	4.00	3.00	5.00	2.33	5.00	5.33	3.00
Rewarding	3	2	2	2	3	6	6	2
	Doesn't reward users. No discount, offers, no extra information or any benefits; only applied cheaper tickets when users purchasing with Pop Cards	Doesn't reward users. No extra information or any benefits; even incorrect information	Doesn't reward users. No extra information or any benefits; even incorrect information	Doesn't reward users. No discount, offers, no extra information or any benefits;	Doesn't reward users. No extra information or any benefits	Doesn't reward users. No extra information or any benefits; but easier to view 'New products'	Doesn't reward users. No extra information or any benefits; but easier to view 'New products'	Doesn't reward users. Too many information that doesn't help older adults to shop
Guidance	2	2	2	9	2	5	5	2
	Doesn't have tutorials or guidance. With only 'Click to start' displayed on the screen in the beginning	Doesn't have tutorials or guidance. With only 'Click to start' displayed on the screen in the beginning	Doesn't have tutorials or guidance. With only 'Click to start' displayed on the screen in the beginning	Have audio guidance. -	Doesn't have tutorials or guidance. With only 'Click to start' displayed on the screen in the beginning	Doesn't have tutorials or guidance. but easy to get human support	Doesn't have tutorials or guidance. But easy to get human support	Doesn't have tutorials or guidance. With only 'Click to start' displayed on the screen in the beginning
Esteemed	2	8	5	4	2	4	5	5
	Not a pleasant interactive space. Not private, busy areas.	Pleasant interactive space. Semi-private, has platforms, funtional.	Average interactive space. No private settings, require own audio devices.	Not a pleasant interactive space. No private settings, busy environments.	Bad interactive space. No private settings, entire body exposes to public, require own audio devices.	Bad interactive space. No private settings, busy environment	Average interactive space. No private settings, busy environment, but spacious	Average interactive space. No private settings

Mixed Method Survey

In past professional engagements, an overreliance on open-ended questions has been observed to potentially test the patience of participants. Hence, in the current study, I adopted a mixed-method approach, integrating both quantitative and qualitative questionnaire formats. This allowed for a balanced distribution of free-form and closed questions throughout the survey process[24].

Questions and Structures

At the same time, I conducted questionnaires for in-depth data and information of my target audience, working with consultant teams to pull out a survey on two platforms. With support from expert consultants and through multiple iterations refining the survey structures and consolidating similar questions, I successfully reduced the initial set of 90 questions to approximately 20, streamlining the survey for enhanced clarity and efficiency.

Platforms

The survey was launched primarily on two platforms: **VOICE** and **This Age Thing**. I employed distinct strategies tailored to the unique audiences of each platform. **VOICE**, being more a general and objective representation of an older population, caters to individuals primarily interested in the broader North East area. Conversely, for **This Age Thing**, which emphasises local engagement, I adopted a more personalised approach by presenting the survey as a narrative 'story'.

Survey Structure - v.2.0
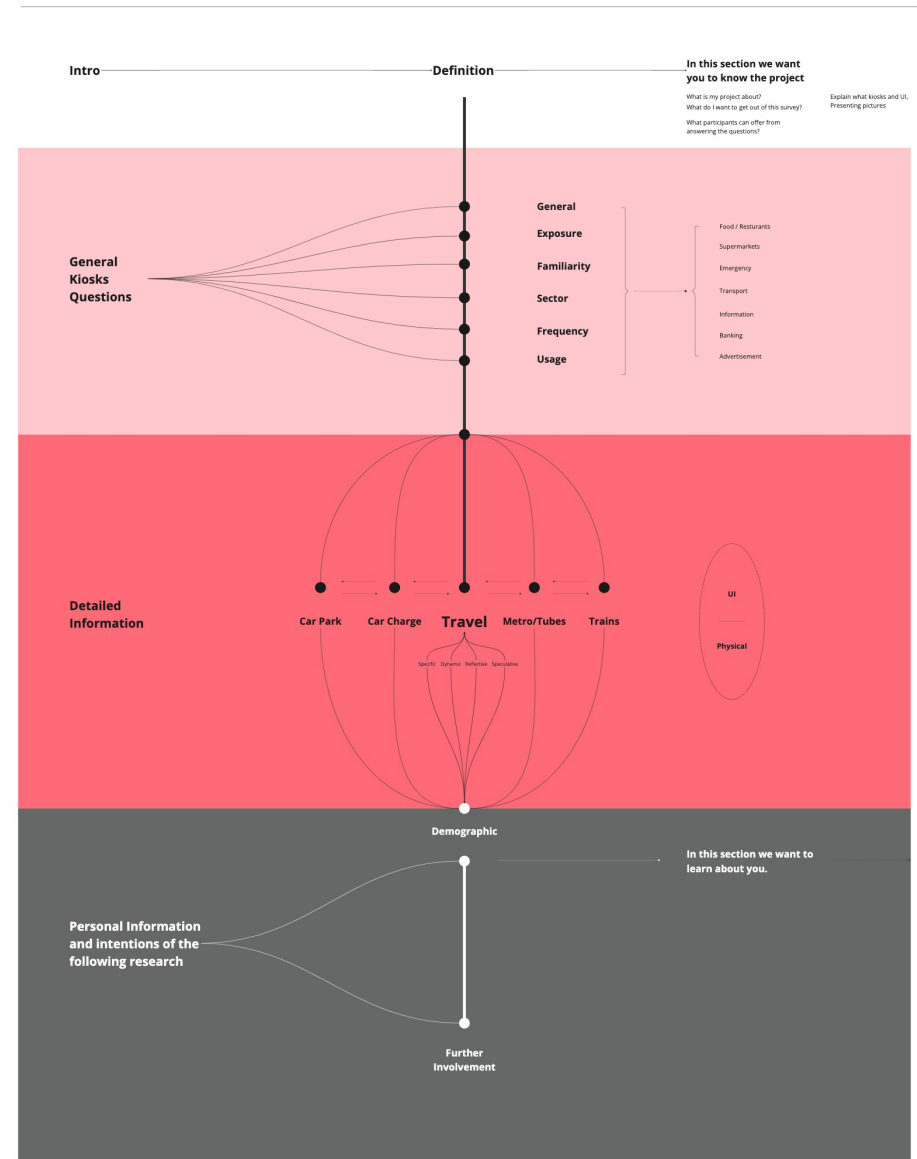
Data Analysis and Visualisation

The mix method survey gathered more than 100 responses of notable quality across both platforms within a span of four weeks. The deliberate approach of targeting diverse platforms yielded fruitful outcomes. Collaborating with NICA's development team, we pulled together a comprehensive analysis of the data collected, leading to a nuanced understanding of various aspects including: the existing landscape of kiosks; identified strengths and weaknesses of the service; and the relevant needs and barriers of the target audience. This insightful result, coupled with the findings from prior research has significantly informed and enriched the ongoing development of the project. Selected key visualisations from the data analysis process are presented in following pages for reference.

Problems - 'non-use' users

As both platforms operate online, participants tend to possess a certain level of digital literacy, posing challenges in reaching individuals who are unable to utilise digital platforms. While the survey successfully screens out a portion of 'non-use users', this demographic remains embedded within the broader population, requiring targeted research to delineate their characteristics.

Particpants Attitude Towards Digital Kiosk Services

Agreement Level 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0

Comments on Kiosks

	Banks ATMs	Car Parks	Car Charge	Fast Food	Light Rails	Info. kiosks	Supermarkets	Train Stations
I am confident using these screens	7.2	5.6	6.8	6.6	6.5	6.9	6.8	6.2
I can easily spot and locate the screens	7.6	6.3	6.2	7.4	7.2	6.3	7.7	7.0
I find it much quicker to use a kiosk service	6.8	5.5	7.5	5.3	6.2	6.1	5.7	5.6
Normally I prefer to use kiosk services	6.1	5.7	7.2	5.4	6.0	5.2	5.5	4.8
I wish I could do more with the kiosks	5.1	4.2	6.2	4.9	4.9	5.4	4.4	4.8
My experience using the kisoks is great	6.4	5.3	5.8	5.4	5.9	5.9	5.6	5.3
Kiosks are easy to use	7.0	5.1	6.5	6.1	5.9	6.2	6.1	5.5
Overall attitude	6.6	5.4	6.6	5.9	6.1	6.0	5.9	5.6

Types of Services

Age range of participants

81-90, 71-80, 61-70, 51-60, 41-50, 31-40, 21-30

Overall Preferred Payment Methods (Public Transport)

Card (Kiosks), Other, Travel Card, Card (Ticket Office), Tap In/out, App (Trainline), Cash (Ticket Office), Digital Wallet (Kiosks), Cash (Kiosks)
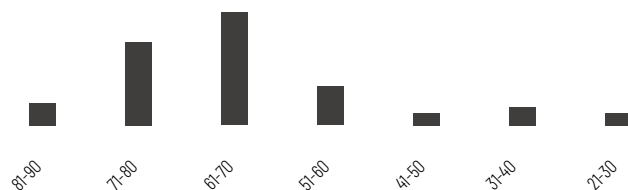
Factors People Struggle with in Public Transport Kiosks

01 Understand the information (ticket cost, restrictions, etc.)
02 Understand how to get human support
03 Navigating the system
04 Lack of information
05 Touch Screen (Slow response, not sensitive enough, etc.)
06 Locate the relevant information to me
07 Screen Brightness
08 Cash Input
09 Lights (Visual Guidance, confirming lights, etc.)

10 Ticket Output Tray
11 Other (Physical Kiosks)
12 Physical Buttons
13 Positions
14 Other (Digital system)
15 Sound Level
16 Understanding what payment methods are accepted
17 Topping up your travel card
18 Kiosk Sizes
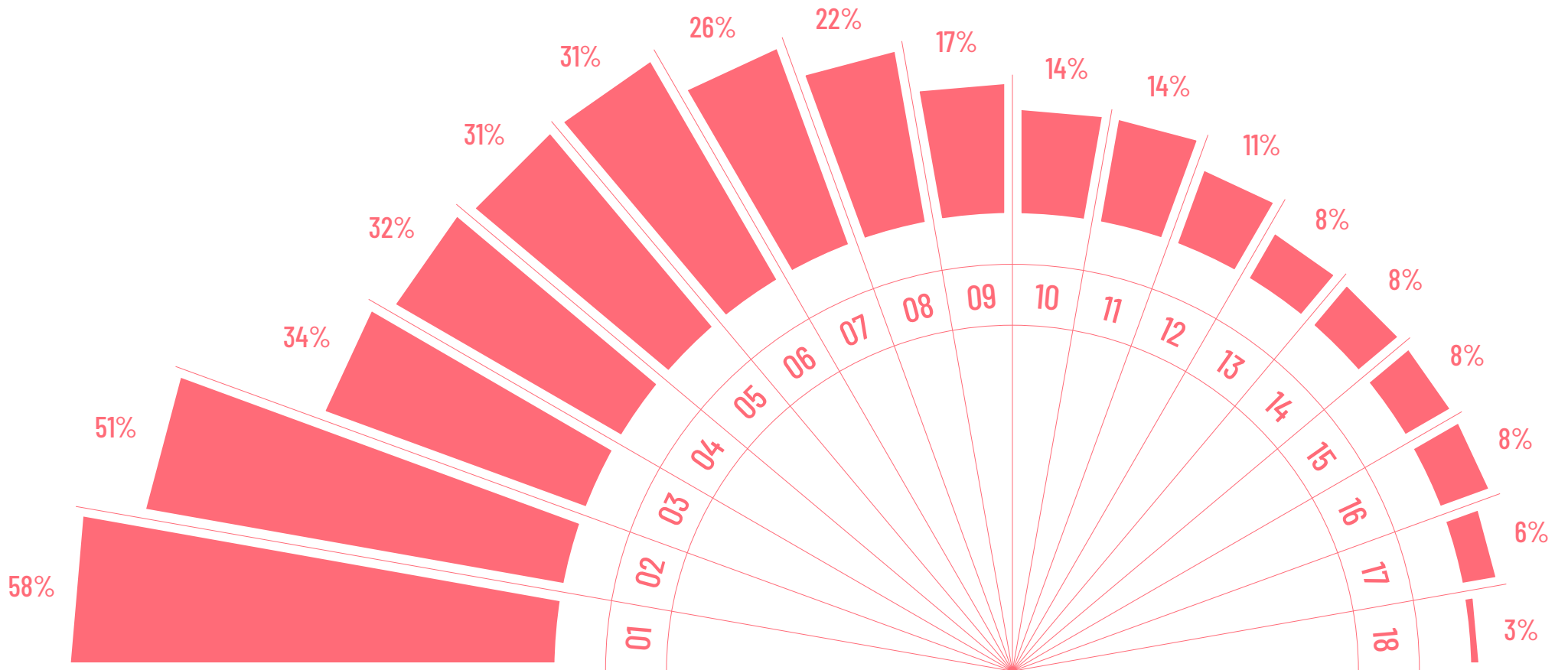
Preferences Between Human Services and Kiosk Services

Interestingly, in contrast with the previous evaluation data, participants showed a strong preference for lower-scoring Light Rail Transport and ATM kiosks, whereas higher-scoring supermarket kiosks were met with disfavour.

Several factors may contribute to this trend. It's possible that the metro (1980) and ATMs (1967), having been in existence for a significant period, are deeply entrenched in people's routines, fostering a sense of familiarity and trust[25]. In contrast, the introduction of supermarket kiosks (2003) represents a relatively recent innovation, requiring time for audiences to establish a level of comfort with the emerging technology[26].

Kiosk Services Preferred

Human Services Preferred

78.0%	75.0%	67.2%	66.7%	57.9%	50.0%	46.7%	37.7%	
22.0%	25.0%	32.8%	33.3%	42.1%	50.0%	53.3%	62.3%	100%

| 50 | 04 | 54 | 81 | 38 | 26 | 75 | 79 | 01 | Responses |

Car Parks · Electric Car Charging · Light Rail Transport · Banks (ATMs) · Fast Food · Public Spaces (Shops) · Supermarkets · Train Stations · Emergency/Information — Types of Services

Ratio of Human/Screen Preference: 0.3 · 0.3 · 0.5 · 0.5 · 0.7 · 1.0 · 1.0 · 1.7 · ∞

1.5 / 1.0 / 0.5

What makes a good kiosk service?

There are three significant key points: Accessible, intuitive, and In-put method. These align with the critical shortcomings identified through the evaluation tool used earlier, indicating a consistent discrepancy between kiosk performance and user expectations.

18% Caters disabilities

16% Explain its decisions (particularly when errors occured)

15% It is easy to be found

58%

The physical machine itself is easy to use (reponsive screen, buttons are easy to click)

The longevity of kiosks is often ensured by the use of bullet-proof glass across various brands, compromising the screen's sensitivity and resulting in less smooth interactions. This issue is particularly critical for older users.

58%

21% Clearly explain its purpose

22% Its Quick to Use

52%

It is Intuitive, I don't need to learn how it works

The kiosks are novel technological products, posing a steeper learning curve for our trageted audience, particularly non-digital natives. along with unfamiliar user interface elements and suboptimal interaction logic, it deters many users.

52%

25% Require least amount of steps to achieve my goals

33%

It provide easy human support when required

Many kiosks can't direct to human support, often separated and lack prominence.

33%

**See page 73 for
the Comparison Analysis**

ADE & Survey Comparison

In the comparison chart, we observe significant shifts in rankings. The fast food kiosks, initially leading in the ADE assessment, now ranks fourth. Conversely, the ATM, previously scoring low, now holds the top spot. The Light Railway kiosks have also seen an ascent.

This shift may be attributed to the high participation rates for ATM and Metro kiosk options due to their widespread availability. Furthermore, the ADE assessment considers various inclusivity factors, potentially resulting in higher scores that do not necessarily reflect actual usage or satisfaction levels. Which were carried to workshop for more insights and test outs.

Given the varying response rates for each item, reflecting the differing usage frequencies, I adjusted the analysis by amalgamating the preference percentages with the corresponding utilisation rates, thereby yielding the final ratio.The conversion formula is: Preferences * (respondants number / total participants)

i.e. New ATMs% = 52.0% = 66.7% * (81 / 104)

Comparison Analysis

Ranks based on the result of ADE evaluation

6.67	6.00	5.78	4.78	4.22	3.89	3.89	2.89

Ranks based on the result of ADE evaluation

52.0% ▲5	34.9% ▲3	33.7% –	21.1% ▼3	12.5% ▲1	0.0% ▼3
Bank (ATMs)	Light Railway	Supermarkets	Fast Food	Public Spaces (Shops)	Emergency / Information
Up to the 1st from the second last	Up to the 2nd place from the 5th	Remains the same	Down to the 4th/5th	Moved to the 2nd last	Down to the last
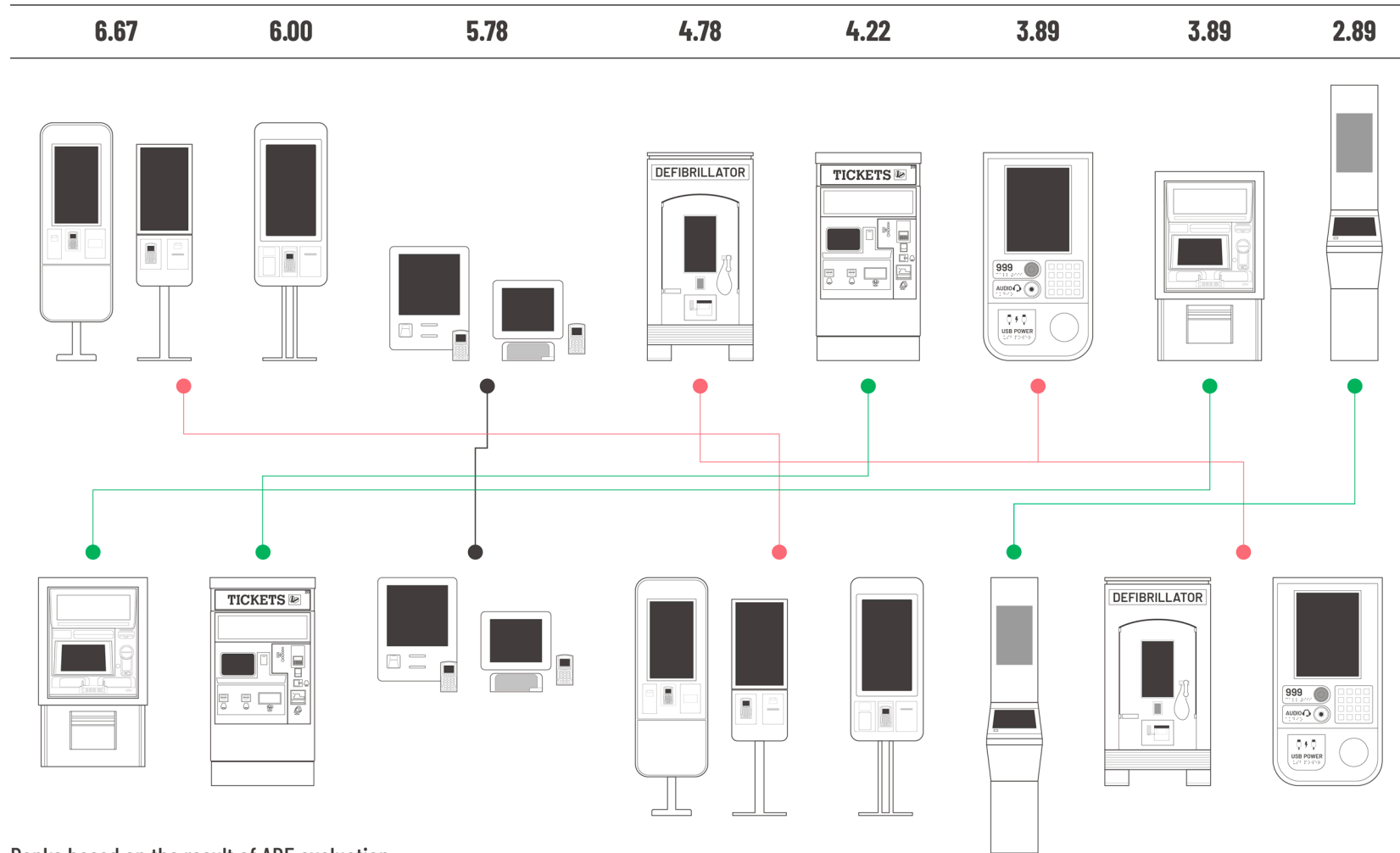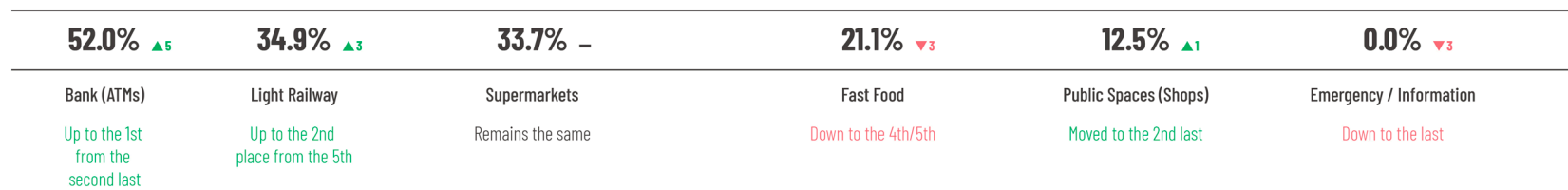
Co-design Workshop

The goal was to glean firsthand insights from the target users, comprehensively understanding their needs, exploring 'non-use' users, and engaging stakeholders in the co-design process. Participants were divided into three groups to facilitate discussions, idea generations, group activities and design exercises. This workshop facilitated an iterative journey aimed at collaboratively identifying user needs.

- **Particpants recruitment –** VOICE platform
- **Number of participants –** 12 (One person was an hour late)
- **Age Range –** 28 - 85
- **Length of time –** 120 minutes
- **Location –** Catalyst, Newcastle Upon Tyne
- **Host/Facilitators –** Zihao Lu, Rosie Wakely, Poppy Robbinson, Sam Monery, Kai Xu

Structure

Focus Group & Co-Design

Focus groups constituted a key aspect of my data analysis and project development. To enhance stakeholder involvement, I consolidated focus group methodologies with co-design principles, thereby engendering the framework and structure of my workshop. I incorporated questioning and discussion aspects from focus groups, assigning a facilitator to each group for note-taking and assistance. Concurrently, I interspersed design activities to enable immediate experimentation with ideas discussed. This symbiotic approach allowed for seamless transition between discussion-derived concepts and hands-on design, fostering iterative ideation and facilitating timely feedback loops.[27]

Agenda

In a compact two hours, I divided the workshop into three parts. The initial segment primarily involved facilitating group discussions to stimulate idea generation, with active participation from myself. Additionally, I rotated among each group to contribute to and engage in the conversation. The second phase primarily consisted of design activities, where participants engaged with facilitators based on structured exercises designed by myself, either collaboratively in groups or individually. The final phase encompassed cross-group communication, design presentations and reviewing. I co-created with the participants to design small-scale speculative kiosks, facilitating the exchange of outcomes among the groups for feedback and constructive critique. Meanwhile, I made a video recording plan in collaboration with technical support for digitalisation documentation.

Tools & Activities

Workshop Tactics®

I employed the 'Rose Thorn Bud' and 'Reverse Brainstorming' techniques, both selected for their efficacy in fostering an engaging atmosphere, expanding participant perspectives, and stimulating the generation of innovative ideas within the co-design framework.[28]

Master Class (DAI)

Primarily, I employed the **Hopes & Fears (H&F)** and **Persona** tools, each carefully tailored to align with the specific requirements of my project. In H&F, I redefined the application of the tool by translating the basic concepts of 'hope' and 'fear' into the user's emotional expression of the kiosk, expressed as a **Rose Thorn Bud**: 'I like it', 'I don't like it', and 'I crave it'. These reimagined categories were then operationalised during the workshop using post-it notes as a medium for expression. Subsequently, these responses were contextualised and systematically applied to the evaluation of the kiosk, facilitating a more nuanced understanding of user attitudes and interactions.

In employing the **Persona** tool, I transitioned from an initial model that was centered around my 'aged self' to a refined model that focused on a hypothetical future kiosk persona. These adaptations were subsequently synthesized into a concise speculative design paradigm. This process culminated in a comprehensive and coherent articulation of the envisioned design concept, thereby facilitating a deeper exploration of the potential user interface and interaction dynamics.[29]

Insight Maps

Insight Maps was an activity strategically employed as a 'clue' throughout the workshop. Participants engaged by delineating their envisioned travel routes on the map, concurrently contemplating the integral role of kiosk services within these contexts.

'Rose Thorn Bud' (Modified from DAI Hope & Fear)

Participants were presented with printed images of kiosks from Northumberland Street and prompted to select the most familiar ones to initiate the process. Utilising the 'Rose Bud Thorn' technique, they documented 5-8 **positive**, **negative**, and **potential opportunities** on post-its, which were then affixed to a whiteboard. This collective input was then presented to the entire group, fostering further ideation.

Kiosk Persona (Modified from DAI Persona)

Engage in anthropomorphic design principles to conceptualise the kiosk, akin to shaping the personality and attributes of a character. Participants are encouraged to envision a speculative transport kiosk, encompassing both physical appearance and digital user interface.

Reverse Brainstorm

The activity was rated as one of the most engaging. As depicted in Figure 2, asking participants to imagine how existing kiosk services could be made worse, reversing the 'bad idea' to a positive concept.
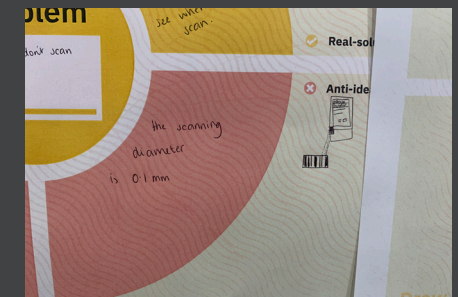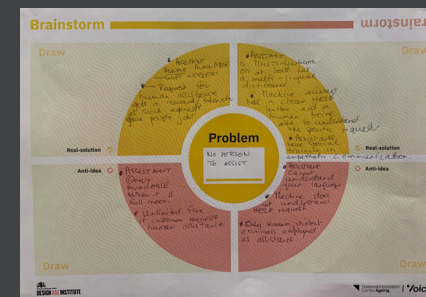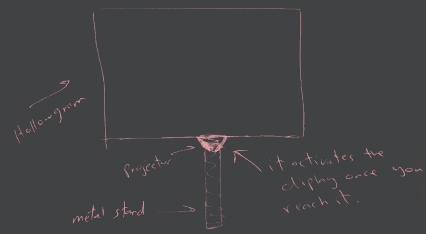
Participants' drawing of their design projects
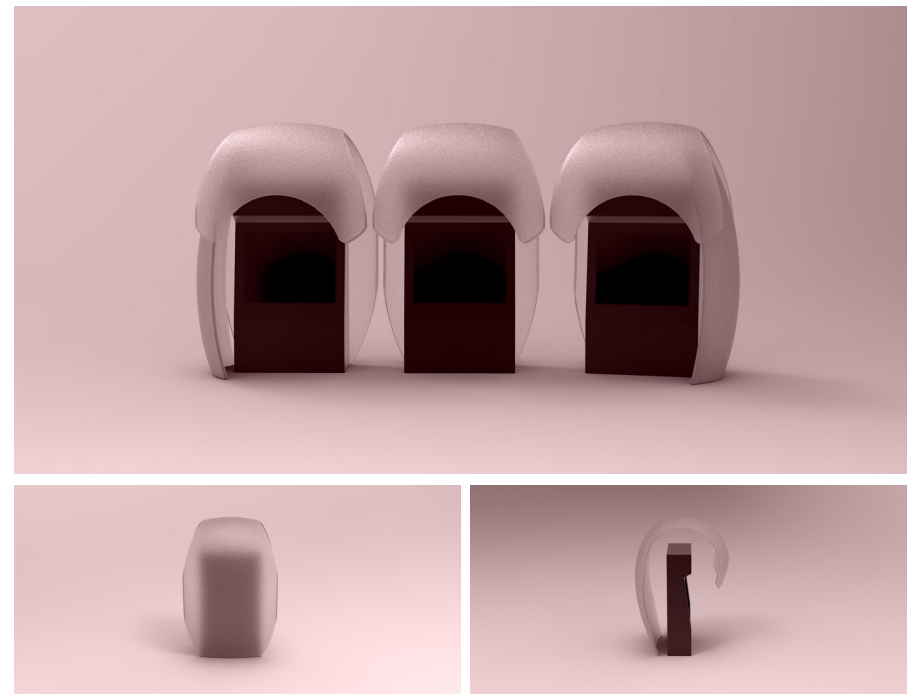
Rendering examples of modeling users' drawings

This workshop unfolds akin to a journey, just like the 'Insight Map' throughout the process. Through co-design, both participants and I revealed significant insights. Initially, users, due to limited exposure to kiosks, often struggle to articulate their needs and have a narrow conception of those services. However, through incremental interaction, each exploration unveiled novel and compelling ideas.

Participants progressively expanded their perspectives, particularly after the 'Reverse Brainstorm' activity, leading to increased blue sky thinking yet pragmatic ideas, infused with humour. During the Kiosk Persona design phase, each group offered unique perspectives, yielding pleasantly surprising conceptual outputs.

In-depth Interviews

To delve deeper into user understanding, I identified two representative audience segments and engaged in a week-long research initiative. Which involved immersive observations of their daily routines and conducting multiple in-depth interviews to collect comprehensive insights. Commonly, with and without digital literacy, they both refuse to be part of the 'App Culture' based on our conversation.

The first interviewee, Kate, is a 78-year-old individual with advanced digital literacy. A former real estate manager on the cusp of retirement, Kate falls within the 'Non-use User' category as delineated by the subdivision framework. Kate incorporates digital devices such as desktop computers and smartphones into her daily routines, a practice that persisted both during her professional tenure and post-retirement. However, she contends with visual impairment, prompting her to restrict her screen exposure. Consequently, Kate tends to eschew digital interfaces, including kiosks, due to their exacerbating effect on her condition. Her screen usage preferences center around factors like **lighting, font size, and color schemes,** influencing her avoidance of public kiosks.

Kate articulated a noteworthy sentiment regarding her aversion to kiosk usage, particularly in non-essential shopping contexts such as supermarkets and fast food outlets. She her discomfort with being dictated to by a machine. 'I don't like using them, I feel like I'm being manipulated by them... I don't like being told what to do and what not to do by a machine,' Kate remarked.

'I felt manipulated by the screen & did not make choices in the way I wanted to...'

– Kate

In-depth Interviews

Marshall, aged 68 and a retired ship engineer, exhibits relatively limited digital literacy and falls within the 'Can't-use User' classification. In his daily life, Marshall has had minimal interaction with smart electronic devices for many years. It wasn't until the past six months, with assistance from his wife and daughter, that he opened his first online bank account and acquired his initial smartphone.

While Kate demonstrated a semi-passive approach in avoiding digital kiosks and emerging technology products, Marshall exhibited a proactive stance. He lacked any inclination to **familiarise himself with such products**, and coupled with the **digital gap that had widened over the years**, he required a **significantly longer learning curve for new technological advancements**. Consequently, his aversion to exposure to such technology only grew stronger over time.

However, I observed that Marshall derived more joy from using these technologies compared to Kate. He expressed that smart appliances, like Amazon, facilitated tasks such as checking football scores, setting timers, and enjoying music at his convenience, experiences he had not encountered previously. Nevertheless, due to the **prerequisite level of digital literacy and unfamiliar interaction mode**, he found himself somewhat overwhelmed by the barrier to entry. 'I don't feel the need to learn them, my wife will just do it for me.' He mentioned multiple times.

'I don't feel the need to learn to use the kiosks, my wife will just Do It for me...'
– Marshall

NEXT?
In-depth analysis about kiosks and UI systems

Design Age Do's

In synthesizing the outcomes of the preceding data analysis, four imperatives have been identified that necessitate immediate attention and action. The four critical elements identified for kiosk and user interface design are distinct yet mutually enhancing.

Physical Kiosks Do's

1. **Make Operable** — Fast responsive screens and buttons, etc., with clear purpose, and easy and smooth interaction for payment, ticket collecting.

2. **Help!** — Whenever users require, there is always a physcial button to call a human support.

3. **Right there** — Be easy to find, always in the obvious location.

3. **For Everyone** — Be usable by everyone equally, they are Inclusive and accessible kiosks that cater various disabilities. With better lightings and sound level, adjusting screen and kiosk sizes.

User Interface Do's

1. **Straight Away** — Doesn't require prior knowledge to use, fast finish.

2. **More Help** — Whenever users require, there is always a direct click to reach to human support, always with guidance (visual hierarchical layout and tutorial guidance to assist).

3. **Smooth** — Seamless, no dead ends, can always go 'Back' or 'Home', and be consistant throughout.

4. **For Everyone** — Be usable by everyone equally, inclusive system that cater various disabilities. Easy wordings, different mode of visual, addtional information fostering final goals, decision and error explanation.
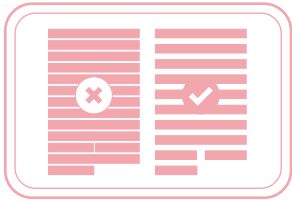
Font size and spacing that make it
easier to identify letters and read
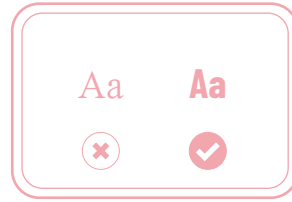
Apply Sans Serif fonts
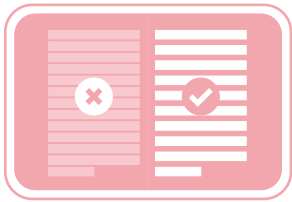
High contrast between texts
and background colour

Visually Hierarchy
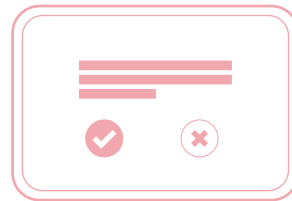
Centred and big click buttons
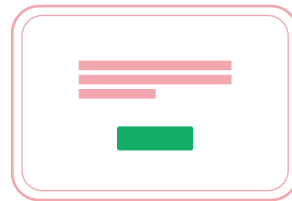
Important options (purchase) using
high contrast colour to guide users

Always use Icons,
and easy icons

Always can go
'Back' and 'Home'

User Interface

Irrespective of the service context, be it car parking, under-ground transit systems, train services, or charging stations, certain foundational user interface guidelines are applicable. In this discourse, I have proposed several recommendations adhering to these principles.[30]

- Font size and spacing that make it easier to identify letters and read;

- Applying Sans Serif fonts with reading age of 9-years-old[31];

- In large text, over 18 points (24 pixels) or bold over 14 points (~19 pixels), we should maintain the standard contrast: at least 4.5:1. In regular text, we recommend using a ratio of at least 1:7;

- Viusally Hierarchy, separate texts and headings;

- It is imperative that prompts are centrally positioned on the display screen, accompanied by prominently sized buttons, whenever critical decisions are necessitated;

- Always use different (opposite) colour to exhibit the important decisions, such as navigate steps, payments;

- Always use Icons, with those easy to identified;

- Recommend 'Back' and 'Home' buttons in every pages;

**Nexus
Metro Kiosk**
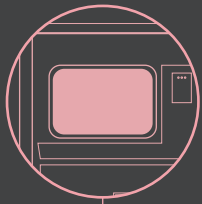
**LNER
Digital Kiosk**
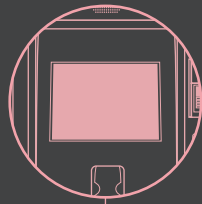
Touch to start

点击使用

**Cliquer pour
dŽmarrer**

Buy Tickets 🎫 Travel Card 💳

Information ℹ Accessibility ♿

Languages

? Help
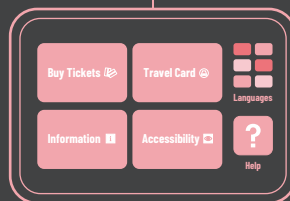
Suggestions to LNER & Nexus Kiosks

Utilising the Nexus Metro and LNER ticket kiosks in Newcastle as illustrative examples, it is proposed that the introduction of animations and transitional screens on the start page could effectively display the 'Touch to Start' prompt in multiple languages. Insights can be gleaned from the information kiosks at King's Cross Station, which incorporate sign language and representations of diverse ethnicities on the starting page. This strategy offers a visually compelling medium to communicate to the audience the machine's commitment to inclusivity and its welcoming nature towards a heterogeneous user demographic.

For the function selection interface, we propose the central placement of the primary functional module descriptors, augmented by an expanded clickable area, to facilitate ease of user interaction. Within the ticketing interface, which constitutes the core functionality of the kiosks, it is advisable to present an array of ticket options for user selection. Subsequently, the interface should offer a detailed description of each ticket type, accompanied by transparent pricing information. The same applies to the pages for topping up travelcards. It is proposed that the payment initiation buttons be distinctly marked in a contrasting color scheme, and that a confirmation prompt be displayed for user verification prior to the execution of each payment transaction. Additionally, upon the completion of payment, a concise notification should be communicated, detailing both the successful transaction and precise instructions regarding the retrieval location of the ticket within the machine. Provide detailed clarifications in the event of recurring payment discrepancies.
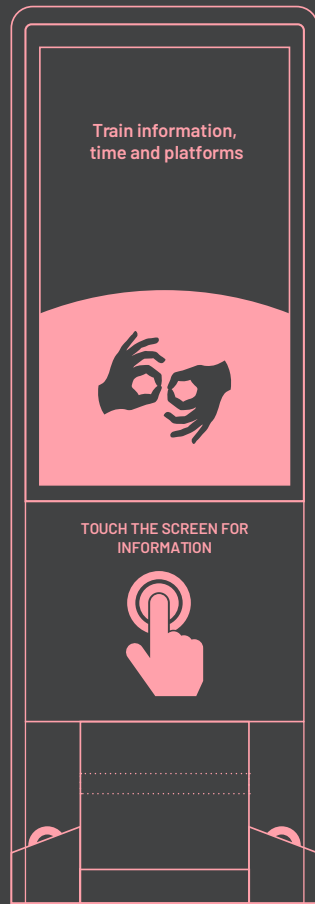
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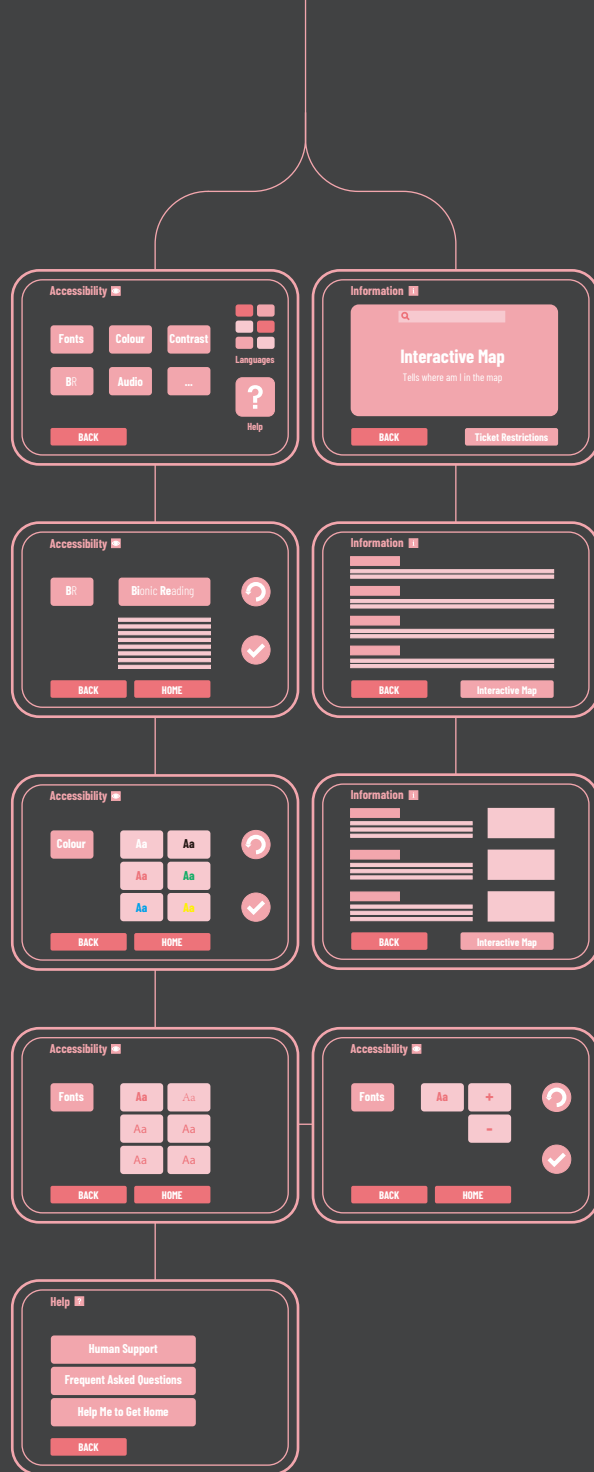
It is advocated that an accessibility area be established, offering options for font customisation, colour selection, and reading style preferences. For instance, Bionic Reading® tailored for individuals with dyslexia and ADHD[32].There should be a button to return to the default.

In the context of information architecture, particularly for metro kiosks, it is advisable to integrate an interactive map equipped with a search function. This feature would alleviate the need for users to continuously alternate between checking information on their mobile devices and the kiosk, or between a physical map and the kiosk. Additionally, it is imperative that the restrictions associated with each ticket type are articulated clearly to prevent misunderstandings.

Additional Information

To address the 'Last Mile Travel' issue, enhancements such as the provision of a Dial-for-a-Ride booking option or detailed descriptions of nearby amenities could be incorporated into the train ticket vending machines. These modifications would significantly enhance the user experience by facilitating seamless travel planning and execution. It is crucial to implement a human service call button for immediate feedback, a feature prominently highlighted as a priority by the majority of participants in both the survey and the workshop phases of our engagement process.

Information kiosk
(INFORM) from
King's Cross Station

Train information,
time and platforms

TOUCH THE SCREEN FOR
INFORMATION

Touch to start

Avoid these types of icons
that might potentially contain
age discriminations.

The user interface design of the kiosk at King's Cross (London) railway station provides a compelling study in clarity and inclusivity. It features a prominently displayed icon that signals interactive functionality and immediately presents critical information, such as the latest train departures and arrivals. Significantly, the design emphasizes inclusivity; the lower half of the screen displays an animation featuring individuals of diverse skin tones using sign language, thereby making the interface accessible to a broader audience.

This design philosophy could be advantageously applied to the initial screen of train/metro ticket machines. In addition to the 'Touch to start' in multiple languages, inclusive information such as sign language and voice guidance can be displayed on the standby screen in the form of short films or animations, users can be informed of the device's support for voice and sign language communications. Additionally, integrating a brief instructional video could further enhance user understanding and ease of use, making the machines more user-friendly and accessible.

Special consideration must be given to the deployment of icons, particularly those representing older individuals. Current iconography in the marketplace often employs potentially ageist symbols, such as depictions of a hobbling gait or hunched posture. It is imperative that such representations are eschewed to avoid perpetuating stereotypes and to foster a more inclusive visual language.

Suggestions for Physical Kiosks
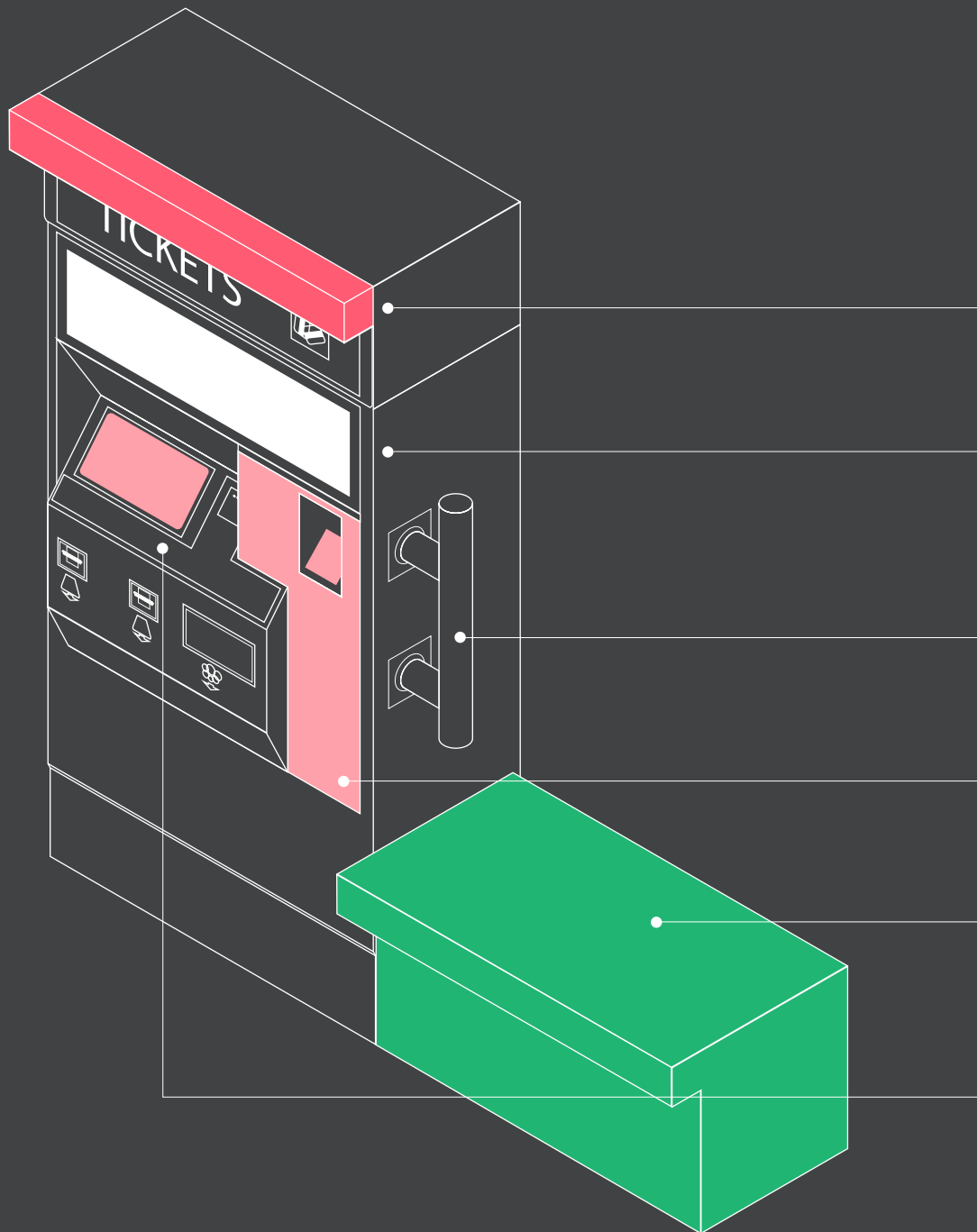
Lightings set up

Depending on contextual requirements, the entirety or a portion of the original map may be incorporated into the user interface system. This strategic integration serves as a means to optimize spatial allocation, thereby enabling the expansion of the display screen's dimensions.

It is advisable to install handrails at this location to provide support for individuals with mobility impairments.

The configuration of the payment modalities is currently disorganized, and a restructuring is recommended to enhance coherence and usability.

Depending on space, benches can be placed here.

The orientation of the display screen is inclined upwards. While enlarging the screen size could permit maintaining the current angle, it is instead recommended that the screen's inclination towards the upper portion be reduced to improve accessibility.

TICKETS

TICKETS
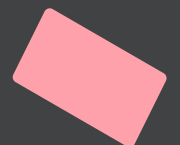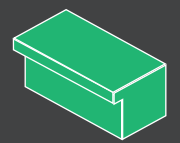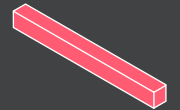
The height of the screen should be between 750mm and 1200mm from the floor[33].

Clear space in front of the kiosks should be 1850 * 2100mm. It is also recommended to include designated guidance surfaces[34].
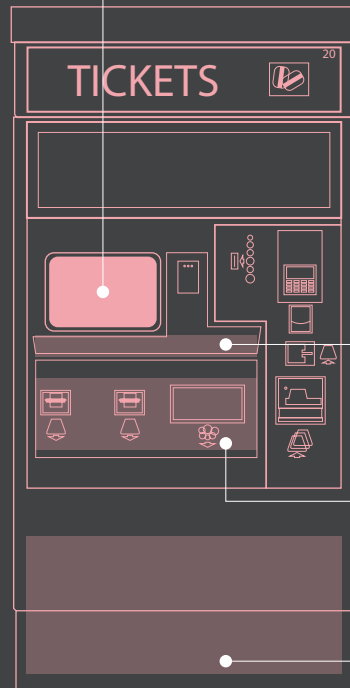
An expansion of the screen area is imperative, yet enhancing screen sensitivity is paramount and should be tailored to individual needs. Recommended strategies include:
1. Replacing the current bullet-proof glass with materials offering greater tactile responsiveness, though this may affect durability.
2. Implementing gloves enhanced with a higher density of myoelectric conductors, available as fixed attachments or disposable options.
Adding peripheral buttons next to the screen to allow for physical interaction, particularly beneficial under reduced touch sensitivity conditions.
4. Developing connectivity protocols for seamless integration with personal mobile devices via QR codes, facilitating direct user interactions like ticket purchases.

It is advised to incorporate the deployment of physical buttons at this juncture. The button can also help visually impaired people to operate the machine with audio aids, and each button need to be designed with Braille.

It is recommended that the number of ticket dispensing points combine to a single outlet, with a separate designated exit for refunds to streamline operations and reduce confusion.

Should circumstances allow, it is advisable to redesign the base into a recessed form. This modification would facilitate greater accessibility for wheelchair users by enabling closer positioning to the interface, thereby enhancing ease of navigation and use.

Platform Edge
(off-street)
Warning Surface
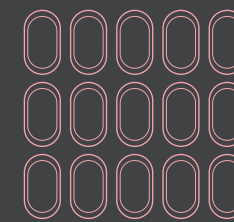
Platform Edge
(on-street)
Warning Surface
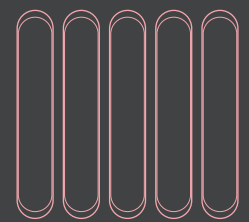
Guidance Path
Surface

'Fun Theory'

Indeed, the mere provision of good services is insufficient to engage users, particularly those who are 'non-users,' in learning how to operate kiosks. One contributing factor is that the Enriching component of the ADE tool does not deliver substantial value. A potential remedy for this deficiency might involve integrating principles from the 'fun theory' discussed earlier. During a conversation with Dr. Jennine, I found considerable inspiration; she suggested that for a kiosk focused on air quality, the exterior could be designed to resemble a large nose. Such an engaging and novel design could entice more individuals to utilize the service. Similarly, for metro station kiosks, encasing the kiosk within a structure resembling a train carriage could create a semi-private, immersive environment, thereby enhancing user interaction and experience.

(The above images are all from my AI-generated experiments based on interviews, not real products.)

The design of kiosks and their digital UI interfaces is not an isolated endeavor but rather a component of an integrated system aimed at maximizing accessibility and inclusiveness. To fully realise this goal, the measures suggested herein are insufficient in isolation. Comprehensive inclusivity necessitates the augmentation of surrounding infrastructure and services, which should include, but not be limited to, the following enhancements:

- Elimination of stair-only access to the kiosks, ensuring barrier-free entry.

- Provision of disabled parking spaces in nearby car parks.

- Installation of accessible routes and lifts where stair access is unavoidable.

- Placement of adequate seating on platforms for resting.

- Availability of staff on standby to assist at all times.

- Implementation of accessible toilet facilities in proximity to the ticket machines.

- Installation of accessible doors at entrances and exits, possibly operated by pressure mats.

- Inclusion of emergency call buttons and tactile guidance paths, as well as platform edge and lift warning surfaces.

Grainger Market Project

Throughout our research, it became apparent that conventional research methodologies were inadequate in engaging users with limited digital literacy effectively. Yet, the Grainger Market project prompted an innovative approach by repurposing a shop within a local market to better connect with this demographic and gather more insightful data.

In 2022, Newcastle City Council secured a space within Grainger Market, a dynamic retail environment, to offer health and well-being support including BMI and blood pressure checks, as well as advice for dementia carers and financial guidance. This strategic location enables access to a broad cross-section of society, including groups typically underrepresented in health data. Additionally, this venue serves as a practical training site for Newcastle University School of Pharmacy students, enhancing their skills through direct community engagement.

The initiative is part of NICA's Internet of Caring Things (IoCT) and was developed in collaboration with academic partners. I participated in both the foundational and developmental stages of the project, finding the experience especially rewarding. The project's primary data sources were surveys, outreach, and street interviews. Future research might benefit from adopting similar collaborative and community-focused methods, with the local market acting as a pilot site to deepen and diversify data collection.

Ways to get involved with Design Age Institute:

Design Age Institute — www.designage.org

Help the Design Age Institute design and demand better choices for our future selves. Designers, keep an eye out for our competitions. Join our **Design Age Institute mailing list** to learn about our projects, policy recommendations, petitions and more.

This Age Thing — www.thisagething.co

Check out This Age Thing to explore and reflect on your future self and our future society. Join our **Community Insights Group** to be the first to hear about upcoming consultations, focus groups and design activities.

Learn more about our partner's work and research:

Oxford Institute of Population Ageing
https://www.ageing.ox.ac.uk/

International Longevity Centre – UK
https://ilcuk.org.uk/

the Design Museum
https://designmuseum.org/

UK National Innovation Centre for Ageing
https://uknica.co.uk/

Ways to get Involved

For further information regarding Design Age Institute work and opportunities for collaboration, please contact:

Design Age Institute
Royal College of Art
Rausing Research Building
15 Parkgate Road, London
SW11 4NL United Kingdom
Email: dai-hhcd@rca.ac.uk
Website: https://designage.org

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